

COURSE PROSPECTUS

**Name of the Group:***CAD/CAM*

**Name of the Course:***P.G. Diploma Course on Advanced CNC Technology*

**Course Code:***CAD 600*

**Starting Date:***14th Nov 2022*

**Duration:***24 Weeks – 720 Hours (@6 hours/day)*

**Course Coordinator:***Dr. Arun Unnikrishnan, Content Writer, Mob: 9567300030*

**No. of Seats:***12*

**Preamble:**The versatile application of CNC machined products has brought a massive change in mass production of components with repeatability and minimizing the rejection rates to a minimum level. As the technology emerges, high demand for skilled personnel versed with advanced CNC technologies has transpired. Advanced CNC Machining Course deals with Advanced Computer operated Machines like Vertical Machining Center and Turning Center. The objective of the course is to create a skilled professional as an Advanced CNC technician. As a senior technician, he can decide the manufacturing Process, sequence of operations, the number of set up, tooling selection, and programming. Also, he can confirm and perform the feasibility study for new product development & support in calculating machining costs.

Apart from the mentioned, he will be trained in designing the machine tools, analyzing the design, programming, maintaining, and testing CNC & VMC machines to increase productivity. Understanding of parameters for machines and their effect on manufacturing cycle time and providing support to each machinist working under his guidance. He can also coordinate and manage manufacturing processes in the plant. Develop budgets for machine shops and estimate up-gradation costs for various processes. Being a knowledgeable person, he will be a vital member of all the decisions related to the industry's objective of manufacturing, costs, productivity, etc.

**Objective of the Course:**This course aims to create qualified engineers who can create, operate, program, and maintain CNC machines for various applications. The course is structured to make the trainees competent enough for adapting to the ongoing changes in the field of the manufacturing industry by providing comprehensive training and knowledge in the field of CNC technology.

**Outcome of the Course:** By the end of this course, the trainees will be able to

- Program manually for any conventional CNC machining case
- Automatically generate programs for any complex part machining
- Operate CNC turning and milling centers
- Design machine tools according to the functionality
- Test and maintain CNC machines
- Use CNC machines for special applications
- Implement CNC technologies for applications other than machining

**Expected Job Roles:**

- 7223.5003 - CNC Operator – Machinist
- 7223.5005 - CNC Setter-cum-Operator – Vertical Machining Centre
- 7223.6001 - CNC Setter-cum-Operator – Turning and Milling
- 7223.6003 - CNC Programmer
- Machining Technician/CNC Operator
- CNC Operator – Machining Technician
- CNC Operator – Machinist
- CNC Operator - Vertical
- CNC Setter-cum-Operator – Turning
- CNC Operator – Turning
- CNC Programmer
- Metal Working Machine Tool Setters and Operators, Others
- Machine Shop Supervisor

**Course Structure:**

S. No.	Module Title	Duration			Credits	
		Theory	Practical	Total	Theory	Practical
1	Introduction to CNC technology	60	0	60	2.5	0
2	CNC programming	60	120	180	2.5	2.5
3	Structural and Constructional features of CNC machines	60	60	120	2.5	1.25
4	Testing and Maintenance of CNC machine-tools	30	30	60	1.25	0.63
5	CNC Machine Design	36	39	75	1.5	0.81
6	Advanced CNC technologies	30	15	45	1.25	0.31
7	Application of CNC technology	30	30	60	1.25	0.63
8	Course Project	0	90	90	0	1.88
9	Interpersonal skills and Entrepreneurship	30	0	30	1.25	0
	<b>Total Duration/Credits</b>	<b>336</b>	<b>384</b>	<b>720</b>	<b>22</b>	

## Other Contents

### I. Course Fees:

**General Candidates:** Course fee is Rs. 60,000 + all taxes as applicable

**SC/ST Candidates :** Limited seats are reserved for SC/ST candidates as per Govt. of India norms on merit basis, and tuition fee is waived for these candidates.

However they are required to remit an amount of **Rs. 6,000/- as Advance caution/security deposit**. This amount will be considered as caution/security deposit and will be refunded after successful completion of the course. If the student fails to complete the course successfully, this amount along with any other caution/security deposits by the student will be forfeited.

### Module wise Course Fee:

Modular admission is also possible

<b>CAD 600 P.G. Diploma Course on Advanced CNC Technology</b>						
<b>Module &amp; Course Code</b>		<b>Module Name</b>	<b>Duration (Weeks)</b>	<b>Fees (for Other candidates)</b>	<b>Payable by SC/ST candidates admitted under reservation quota</b>	<b>Prerequisite</b>
Module I	CNC 001	Introduction to CNC technology	2 Weeks – 60 Hours (@6 hours/day)	5000 Excluding GST	Rs. 500/- (refundable after successful completion of course)	Nil
Module II	CNC 002	CNC programming	6 Weeks – 180 Hours (@6 hours/day)	15,000 Excluding GST	Rs. 1,500/- (refundable after successful completion of course)	CNC001
Module III	CNC 003	Structural and Constructional features of CNC machines	4 Weeks–120 Hours (@6 hours/day)	10,000 Excluding GST	Rs. 1,000/- (refundable after successful completion of course)	CNC001
Module IV	CNC 004	Testing and Maintenance of CNC machine-tools	2 Weeks–60 Hours (@6 hours/day)	5000 Excluding GST	Rs. 500/- (refundable after successful completion of course)	CNC001, CNC003
Module V	CNC 005	CNC Machine Design	2.5 Weeks–75 Hours (@6 hours/day)	6250 Excluding GST	Rs.625/- (refundable after successful completion of course)	CNC001, CNC003

Module VI	CNC 006	Advanced CNC technologies	1.5 Week – 45 Hours (@6 hours/day)	3,750 Excluding GST	Rs. 375/- (refundable after successful completion of course)	CNC001, CNC002
Module VII	CNC 007	Application of CNC technology	2 Week – 60 Hours (@6 hours/day)	5000 Excluding GST	Rs. 500/- (refundable after successful completion of course)	Nil
Module VIII	CNC 008	Course Project	3 Weeks–90 Hours (@6 hours/day)	7500 Excluding GST	Rs. 750/- (refundable after successful completion of course)	CNC003/ CNC004/ CNC005/
Module IX	ISE 001	Interpersonal skills and Entrepreneurship	1 Weeks–30 Hours (@6 hours/day)	2500 Excluding GST	Rs. 250/- (refundable after successful completion of course)	Nil

**II. Registration Fee:** An amount of Rs.1000/- (including all taxes as applicable)(nonrefundable) should be paid at the time of registering for the course.

This fee shall be considered as part of course fee, if the student joins the course. If a student register and pay for more than one course and join for any one course, all such amount will be adjusted against the course fee payable.

If the student does not join for the registered course / any of the registered courses, fee paid shall be forfeited.

**For SC/ST candidates admitted under reservation quota, the registration fee is Rs.500/- and** will be considered as part of caution/security deposit and will be refunded after successful completion of the course. If the candidate does not join or fails to complete the course the amount will be forfeited

**For all other candidates the registration fee shall be Rs. 1000/-**

However above the registration fee shall be refunded on few special cases as given below

- Course postponed and new date is not convenient for the student
- Course cancelled in advance, well before the admission date

### III. Course Fee Installment Structure:

Students can pay the full fees of Rs. 70,800/- (Rs.60,000/- + all taxes as applicable) in advance or as installments as given below

Fees	*Amount for Other Candidates	Amount for SC/ST Candidates admitted under reservation quota (considered as caution/security deposit)	Due Date (on or before)
Registration Fee	Rs.1000/-	Rs.500/-	During Registration
1 <sup>st</sup> Installment	Rs. 41,300/-	Rs. 6,000/-	14/11/2022
2 <sup>nd</sup> Installment	Rs. 29,500/-	Nil	03/01/2023
Total Fee	Rs. 70,800/-	Rs. 6,000/- (refundable after successful completion of course)	Nil

\*Above fees is inclusive CGST 9% and SGST 9%, and revision, if any by Government shall be applicable at the time of payment.

# Fine will be applicable for late fee payment.

**IV. Eligibility :** *B.E/ B.Tech in Mechanical Engineering/ Equivalent (\*Final year students also may apply)*

*\* Certificate will be issued only after successful completion of the mentioned Eligibility Criteria.*

**V. Number of Seats :** 12

**VI. Selection of candidates :** *The candidates passed in the qualifying examination will be based on their marks obtained, subject to eligibility and availability of seats*

**VII. Test/Interview (if applicable) :** *Not Applicable*

**VIII. Counseling/Admission :** *Starting date of the course*

**IX. Important Dates (if applicable) :**

<i>Starting date:</i>	<b>14.11.22</b>
<i>Last date to submit application form:</i>	<b>06.11.22</b>
<i>Selection intimation in website:</i>	<b>08.11.22</b>
<i>Counseling/Admission</i>	<b>14.11.22</b>
<i>Commencement of class work:</i>	<b>14.11.22</b>
<i>Payment of Fee</i>	<b>14.11.22</b>

**X. Course Timings** 10:00 Hrs to 17:00 Hrs (13:00 Hrs to 14:00 Hrs Lunch break)(Excl Saturdays, Sundays and National Holidays)

**XI. Placement :** *Support shall be provided*

**XII. Lab Facilities:** Air-conditioned lab consists of CNC Lathe, CNC Milling Centre, Ultimaker 3-D Printer, PCs, Classroom Facilities, Basic Workshop facilities, CREO Parametric, ANSYS, Skylab/MATLAB, 3-D Experience

**XIII. Course Contents :**

**Course Brief – CAD600 PG Diploma Course on Advanced CNC Technology**

The policy decisions such as ‘Make in India’ have boosted the manufacturing industry to a great extent. Even with the fact that the economic contribution from the manufacturing industry to the GDP is very marginal, impressive growth during the last decade and a half are registered. It has been realized that the country's growth requires raising the skill levels of individuals, which will be critical to success, as will more vital collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment.

CNC is one of the most efficient production technologies used, enabling high productivity with reduced human resources. Precision, accuracy, and increased production rates make this technology advantageous to modern industrial firms. As it is a widely accepted technology, the demand for CNC engineers has continued to be high for the last two decades worldwide. The present manufacturing industry needs an efficient workforce in CNC technology, which has a vivid knowledge regarding the design, production, operation, programming, and maintenance of CNC machines. It could also account for the latest outfits in the industry as a part of Industry 4.0.

The course provides a sturdy platform wherein the students will master CNC technology as a whole. From the basic understanding of machining using CNC machines, the trainees will learn conventional programming, computer-aided process planning, and programming for any general case in machining. The fundamentals of CNC- Machine tool design and their constructional features will enable the students to understand how the structural design converts to the accuracy of the machine. Along with the knowledge of machine tool design, the students will be able to create their CNC machines according to the design requirements. The course does not limit the trainees to machining but other applications where similar technologies could be implemented. The advancements in the technology could be experienced and practiced along with course and course projects.

## **ADVANCED CNC TECHNOLOGY**

The contents of the modules are listed below.

### **Introduction to CNC Technology – 60 Hrs**

Manufacturing and Machining, Basics of Machining, Evolution of machine tools, NC machines, CNC machines, Automation and DNC system. Introduction to machine tools: Basic Machining Operations, Operations performed in Lathe, Milling machines etc., Number of axis and control, Types of machine tools, Types of control systems. Health and Safety: Introduction to safety equipment and their uses, Occupational Safety, Environment guidelines, legislations & regulations, Disposal procedure of waste materials, Warning, caution & personal safety while using Machine tools.

### **CNC Programming – 180 Hrs**

Introduction to CNC programming, Introduction and demonstration of line programs CNC programming for lathe & milling machine using ISO codes for CNC machines. CNC programming for lathe and milling machines using different machining cycles. Procedures Associated with part programming, cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations. Programming exercise. Machining of programmed exercise on CNC lathe & milling machines Prepare operation and operation sequence for the lathe operations like turning, grooving etc. Prepare & set CNC lathe operations and test run. Plan and optimize programs for CNC turning and milling operations.

### **Structural and Constructional Features of CNC Machines – 120 Hrs**

Elements of a CNC Machine Tool, Control and electronics Electric drives (electromechanical drives), Mechanical elements (table, Slide, tool holder, etc.), Coolant system, Servo Control Unit, Central Processing Unit (CPU), Hydraulic power pack, Operator Control Panel, Video Display Unit, Machine Control Panel. Design of Modern CNC Machines: Machine structure, Guide ways, Feed drives, Spindle & spindle bearings, Controllers, software & operator interface, Measuring instruments, Gauging, Tool monitoring. Work Holding and Tool holding: Devices



and equipment used for Work holding and locating, clamping devices, Tool holding mechanisms, Automatic tool changers, mechanism of tool changing, Tool magazines, Jigs and Fixtures, Auxiliary units and Subunits, Robotics and automation in work holding and material Transport.

## **Testing and Maintenance of CNC Machine-Tools – 60 Hrs**

Types of accuracy of CNC machine tools: Geometric, Working, and Production accuracies, Positioning accuracy, Interpolation accuracy, Volumetric accuracy, and thermal expansion. Compensations: Process level and Machine tool Level. Testing of machine Tools: Direct and Indirect methods, Form error measurements alignment testing, Installation procedures. Maintenance of Machine: Dismantle, Repair and assembly of mechanical components. Preventive maintenance and Breakdown maintenance plans, Condition monitoring systems and error detection. Time based maintenance plans, Maintenance levels: Electrical, Pneumatic, mechanical etc. Troubleshooting and overhauling.

## **CNC Machine Design – 90 Hrs**

Introduction to Machine Tool Drives: Constructional and operational features, General Requirements of Machine Tool Design, Working and Auxiliary Motions in Machine Tools, Kinematics of Machine Tools, Motion Transmission, mechanical, hydraulic, and electric drives. Design of Machine Tool Structures: Design criteria for Machine Tool Structures, Materials of Machine Tool Structures, Static and Dynamic Stiffness, Profiles of Machine Tool Structures, Basic Design Procedure of Machine Tool Structures, Design of Beds, Columns, saddles, carriages, Bases, and Tables. Design of Guideways and Power Screws, Regulation of Speed and Feed Rates, Design of Spindles and Spindle Supports, Dynamics of Machine Tools, Control Systems in Machine Tools, Ergonomics and aesthetic design.

## **Advanced CNC Technologies – 60 Hrs**

Higher axis machines, Programming for higher axis CNC controllers, Freeform and surface machining, modular and reconfigurable machine tools and their programming, Special purpose machines and programming, Controllers and peculiarities, Measurement using CNC machines, materials and CNC machining,



Automation within CNC, Lean Machine tools, Design optimization and Energy efficiency of CNC machines

### **Application of CNC Technology – 60 Hrs**

CNC machines for Welding, forming, plastic manufacturing, 3-d Printing etc. Program generation for EDMs and CMMs. Die and Mold manufacturing, Aerospace, automobile, biomedical, packing and other applications of CNC technology. Specific application case studies. Recent Developments and Future of the technology. Career in CNC technology, Personality traits, Entrepreneurship and opportunities.

### **Interpersonal Skills and Entrepreneurship – 30 Hrs**

Effective Communication, Development competency, Proficiency in English, Self & time management, Motivation techniques, interpersonal Skill development, Computer literacy, Life skills, Entrepreneurship, Occupational safety, Health and Environment- Education.

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